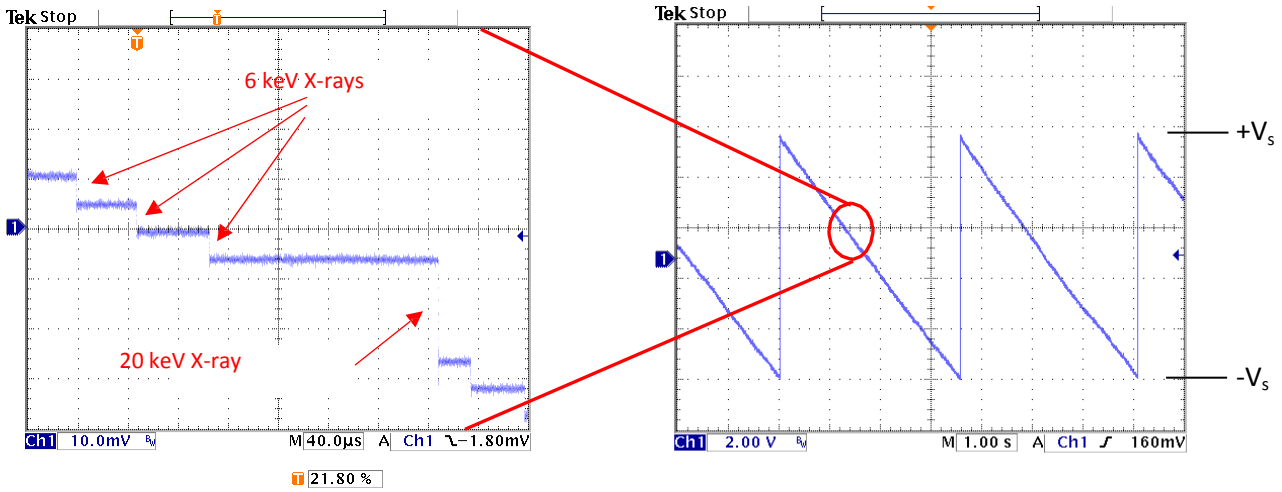
# Application Note: Reset Preamplifier

**What should the preamplifier output look like?**




The plot on the left shows the signal pulses out of the preamplifier (gain is about 1 mV/keV). The plot on the right is "zoomed out" and show the reset waveform.

This plot is for a SiPIN detector. An SDD produces pulses of the opposite polarity: positive going steps and then negative going resets. Some detectors and preamplifiers will have a different conversion gain (the FastSDD is about 4 mV/keV) and some reset over a different range.

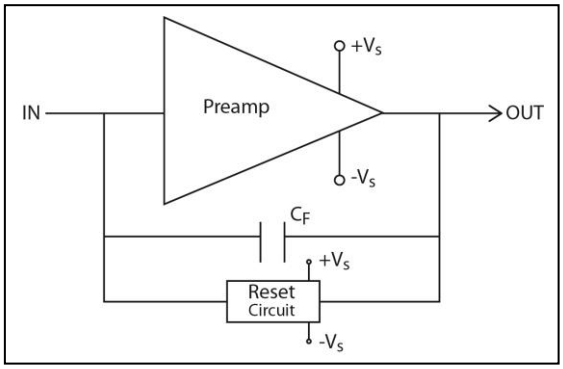
**Why do you have the big "sawtooth" waveform?**

Each X-ray interaction produces a small step. These steps are all in the same direction, so eventually the preamp output will go to the amplifier's $-V_s$. The reset drives the preamp back to the $+V_s$. The output can then step from there. Even without a signal, the leakage current through the detector will cause the output to drift towards the $-V_s$, requiring a reset. The frequency of the triangular reset waveform will depend on the sum of the detector leakage current and the x-ray counting rate from the detector.

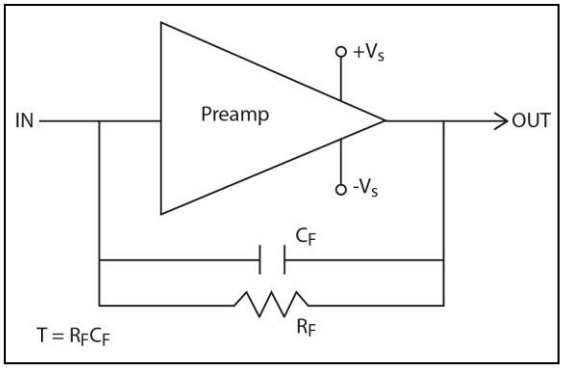
**Do all preamplifiers produce this reset waveform?**

No, there are preamps which use a "continuous" reset. The simplest preamps just have a feedback resistor in parallel with the feedback capacitor. After each signal pulse, of a few millivolts, the pulse decays exponentially back to baseline, with a time constant that is typically anywhere from 50 µs to 1 ms. But the feedback resistor adds thermal noise, thus degrading energy resolution. High energy resolution preamps all use the reset approach.

**Reset Preamplifier**




**RC Feedback Preamplifier**




**AMPTEK, Inc.** 14 DeAngelo Drive, Bedford, MA 01730-2204 USA
+1 781 275-2242 Fax: +1 781 275-3470 www.amptek.com sales@amptek.com